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W DEPARTMENT OF WILDLIFE Washington

July 1993



STATUS OF THE WESTERN GRAY SQUIRREL (*Sciurus griseus*) IN WASHINGTON



Washington
Department of Wildlife
Wildlife Management Division

The Washington Department of Wildlife maintains a list of endangered, threatened and sensitive species (Washington Administrative Codes 232-12-014 and 232-12-011, Appendix B). Species are evaluated for listing using a set of procedures developed by a group of citizens, interest groups, and state and federal agencies (Washington Administrative Code 232-12-297, Appendix B). The procedures were adopted by the Washington Wildlife Commission in 1990. They specify how species listing will be initiated, criteria for listing and delisting, public review, and recovery and management of listed species.

The first step in the process is to develop a preliminary species status report. The report includes a review of information relevant to the species' status in Washington including, but not limited to: historic, current, and future species population trends, natural history including ecological relationships, historic and current habitat trends, population demographics and their relationship to long term sustainability, and historic and current species management activities.

The procedures then provide for a 90-day public review opportunity for interested parties to submit new scientific data relevant to the status report and classification recommendation. During the 90-day review period, the Department holds one public meeting in each of its administrative regions. At the close of the review of the draft report, the Department completes a final status report and listing recommendation for presentation to the Washington Wildlife Commission. The final report, listing recommendation, and any State Environmental Policy Act findings are then released for public review 30 days prior to the Commission presentation.

This report is the Department of Wildlife's final Status Report and listing recommendation for the western gray squirrel. The listing proposal will be presented to the Washington Wildlife Commission on August 14, 1993 at the Colville Community Center, Colville, Washington. Comments on the report and recommendation may be sent to: Endangered Species Program Manager, Washington Department of Wildlife, 600 Capitol Way N, Olympia, WA 98501-1091; or presented to the Wildlife Commission at its August 14 meeting.

This report should be cited as:

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Status of the
Western Gray Squirrel
(*Sciurus griseus*)
in Washington

July 1993

Washington Department of Wildlife
600 Capitol Way N
Olympia, WA 98501-1091

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES	v
ACKNOWLEDGMENTS	vi
EXECUTIVE SUMMARY	vii
TAXONOMY	1
DESCRIPTION	1
GEOGRAPHICAL DISTRIBUTION	2
North America	2
Washington	2
NATURAL HISTORY	7
Behavioral Characteristics	7
Food	8
Feeding Behavior	8
Home Range	9
HABITAT REQUIREMENTS	10
General	10
Breeding Habitat	10
Seasonal Habitat	11
POPULATION DYNAMICS	11
Reproduction	11
Mortality	11
POPULATION STATUS	12
Past	12
Southern Puget Sound.	13
Columbia River Gorge.	13
Yakima County.	13
Chelan and Okanogan counties	13
Present	14
Southern Puget Sound.	14
Columbia River Gorge	14
Yakima County.	15
Chelan and Okanogan counties	15

Future	15
Southern Puget Sound	15
Columbia River Gorge.	15
Chelan and Okanogan counties	15
HABITAT STATUS	15
Southern Puget Sound.	16
Columbia Gorge	16
CONSERVATION STATUS	17
Legal Status	17
Management Activities	17
FACTORS AFFECTING CONTINUED EXISTENCE	18
Adequacy of Existing Regulatory Mechanisms	18
General	19
Interspecific Relationships	19
Present and Threatened Habitat Loss	21
Other Natural and Manmade Factors	21
CONCLUSIONS AND RECOMMENDATION	22
REFERENCES CITED	23
PERSONAL COMMUNICATIONS	26
Appendix A. Reliable observations of western gray squirrel (<i>Sciurus griseus</i>) in Washington, 1940 to present	28
Appendix B. Washington Administrative Codes	33

LIST OF TABLES AND FIGURES

Table 1. Measurements of western gray squirrels from a north-central Oregon population (from Foster 1992). Samples include juveniles and adults, and pregnant females.	2
Table 2. Documented records of western gray squirrel (<i>Sciurus griseus</i>) in Washington	5
Table 3. Home range and density estimates for western gray squirrels	9
Figure 1. Range of the western gray squirrel	2
Figure 2. Historic and current distribution of the western gray squirrel in Washington	3
Figure 3. Historic Indian villages and range of Oregon white oak in Washington	4

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EXECUTIVE SUMMARY

The western gray squirrel (*Sciurus griseus*) ranges from north-central Washington to southern California including parts of the California coast. It once occurred throughout Washington's oak-conifer forests but is now less widely distributed. Remnant populations exist in southern Puget Sound, Klickitat, Okanogan, and possibly Yakima counties.

There is a close correlation between the distributions of Oregon white oak and the western gray squirrel in Washington. This co-occurrence is not surprising since oak mast is a critical winter food item for this squirrel. Other food items in order of significance are underground fungi, green conifer cones and seeds, other mast, and green vegetation. Western gray squirrels inhabit three vegetation types in three regions of Washington: the Oregon white oak-Douglas-fir woodlands of the southern Puget Trough, the white oak-ponderosa pine woodlands of the Columbia River Gorge, and the grand fir-Douglas-fir zone in Chelan and Okanogan counties. Western gray squirrels need a variety of mast-producing trees and shrubs for food, cover, and nesting sites. Quality habitat includes a moderately-closed tree canopy for arboreal travel, several mast-bearing trees species, large-sized trees for nests and mast production, and proximity to water. Most western grays build round stick nests in large conifers.

The western gray squirrel has an intermediate reproductive rate, producing one litter of two to five young between March and June each year. Their life span in the wild is about 8-10 years.

Prehistoric climate change caused a reduction in oak woodlands and a probable decline in the gray squirrel population. Recent population declines are attributed to a combination of factors: habitat loss and conversion, fluctuating food supplies, disease, interspecific competition, road kills, and illegal shooting. There are no signs of population recovery. The recent reduction and fragmentation of suitable habitat is a result of fire suppression, logging, over-grazing, and residential development. Current regulations are not adequate to protect the habitat and restore western gray squirrel populations.

This combination of adverse factors places the western gray squirrel in danger of extirpation throughout most of its range in Washington. The Columbia River Gorge may harbor the last viable local population of this species in the state.

It is recommended that the western gray squirrel be designated as a threatened species in Washington.

TAXONOMY

The western gray squirrel (*Sciurus griseus*) belongs to the mammalian order Rodentia, the suborder Sciurognathi, and the family Sciuridae. There are three subspecies of western gray squirrel. *S. g. griseus* ranges from central Washington to central California, *S. g. anthonyi* is in southern California, and *S. g. nigripes* ranges along the central and southern California coast (Fig. 1). The only other members of the genus *Sciurus* in Washington are two introduced species, the eastern gray squirrel (*Sciurus carolinensis*) and the fox squirrel (*Sciurus niger*).

Studies of the bacula of squirrels indicate that there is a close phylogenetic relationship between the eastern gray squirrel, the fox squirrel, and the red squirrel (*Tamiasciurus hudsonicus*), while the western gray squirrel and Abert's squirrel (*Sciurus aberti*) have similar bacula (Pocock 1923 in Foster 1992, Wade and Gilbert 1940 in Foster 1992).

DESCRIPTION

The western gray squirrel was first described by Lewis and Clark at the Dalles, Oregon. It is also called the "silver gray squirrel" because of its coloration. It has a counter-shaded pelage of silver gray on the dorsal surface and a creamy white ventral surface. The tail is long, bushy, and edged with white. The darker hairs within the tail give it a pepper gray-frost effect. There is a light reddish-brown area on the back of the ears. It is discernable from the eastern gray squirrel which has a reddish-brown wash over its back and tail, and from the fox squirrel which has buff to orange underparts.

The California or Beechey's ground squirrel (*Spermophilus beecheyi*) may be confused with the western gray squirrel in the Columbia River Gorge and east Cascades. It differs from the western gray squirrel in color with spotted or dappled gray on its back and a buff belly. Its tail is less bushy and slightly longer than half its body length, whereas the tail of the western gray squirrel is longer than its body when curled over its back (Ingles 1965, Burt and Grossenheider 1976, Larrison 1976).

The western gray squirrel is the largest native tree squirrel in the Pacific Northwest. Foster (1992) found considerable overlap in the length and weight of male and female squirrels in a north-central Oregon population, although males tended to be slightly larger (Table 1).

Table 1. Measurements of western gray squirrels from a north-central Oregon population (from Foster 1992). Samples include juveniles and adults, and pregnant females.

N	Sex	Length (cm)		Tail length (cm)		Weight (g)	
		Range	Mean	Range	Mean	Range	Mean
36	F	27-35	30.8	24-38	31.3	500-950	781
17	M	27-39	32.9	24-38	31.8	525-925	806

GEOGRAPHICAL DISTRIBUTION

North America

The western gray squirrel ranges from north-central Washington south to southern California including parts of the California coast (Fig. 1).

Washington

Historically, in Washington the western gray squirrel was associated with oak communities from southern Puget Sound south to the Columbia River, east along the Columbia River Gorge in the southern Cascades and north along the eastern slopes of the Cascades to Lake Chelan (Taylor and Shaw 1929, Dalquest 1948, Ingles 1965, Hall 1981). Museum records (Table 2) and observations (Appendix A) show that their range has extended north into Okanogan County since 1965.

Booth (1947) and Dalquest (1948) believed that this squirrel once ranged throughout western Washington and the Cascades. Bowles (1921) said there was a common theory that the western gray squirrel was introduced in the Puget Sound region, but he believed they could have easily migrated northward from the Willamette Valley of Oregon. He based this theory on documented mass movements of closely related species.

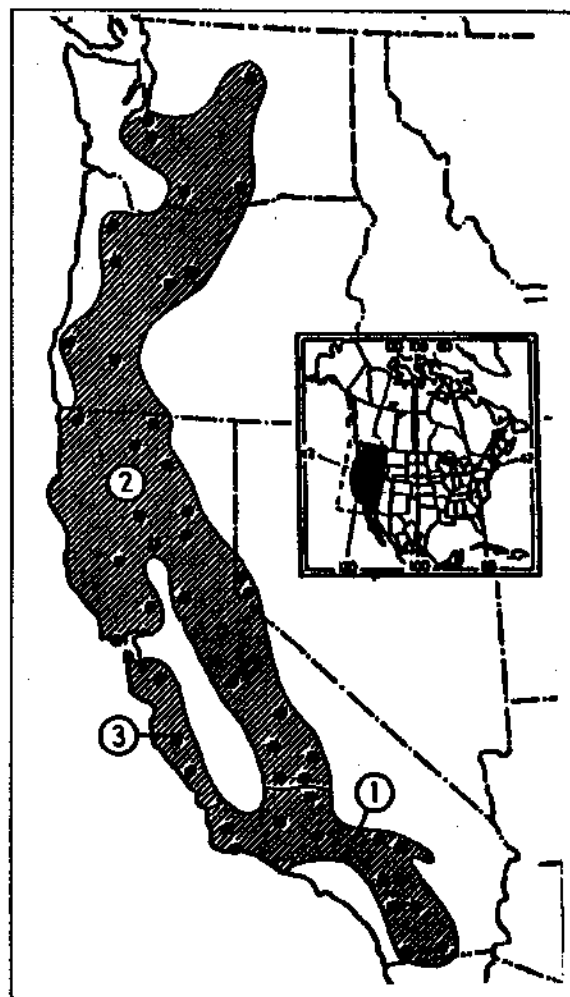


Figure 1. Range of the western gray squirrel (Hall 1981). Numbers refer to type specimens for (1) *Sciurus griseus anthonyi*, (2) *S. g. griseus*, and (3) *S. g. nigripes*.

Documented records and other sightings of the western gray squirrel reveal a spotty distribution which closely resembles that of Oregon white oak (*Quercus garryana*) in Washington (Fig. 2). The species are associated in small, disjunct populations (Barnum 1975, Taylor and Boss 1975). This co-occurrence is not surprising since oak mast is a critical winter food item for the western gray squirrel (Stienecker and Browning 1970). This squirrel appears to maintain populations primarily where oak communities exist.

A look at the prehistoric distribution of oak in Washington suggests a parallel hypothesis of distribution for the western gray squirrel. Taylor and Boss (1975) state that the northward migration of oak from the Willamette Valley, Oregon occurred during the drying and cooling periods of the late Tertiary. Pollen spectra samples indicate that oak communities were common around Puget Sound during the warm, dry post-glacial period about 10,000 years ago. Since that time, as a result of a trend towards cooler and moister conditions, oak communities have diminished and been replaced by conifer forests (Kertis 1986).

A co-distribution hypothesis would suggest that the western gray squirrel migrated northward with the spread of oak, was more widely distributed in prehistoric times, and diminished in recent times along with the oak woodlands. Squirrels are known to be the major long-distance dispersal agents for acorns, thus aiding the migration of oak (Rodrick 1986). Taylor and Boss (1975) found a close association of Native American villages and oak communities, even in disjunct localities (Fig. 3). They speculated that either the Indians chose to live in oak communities or they planted acorns where they settled, possibly reintroducing oak to parts of its prehistoric range.

Barnum (1975) speculates that the western gray squirrel expanded its range into Chelan and Okanogan counties beyond the range of oak in response to plantings of walnut trees by early settlers. Recent discussions with retired Washington Department of Wildlife personnel confirm this expansion (J. Patterson, pers. comm.).

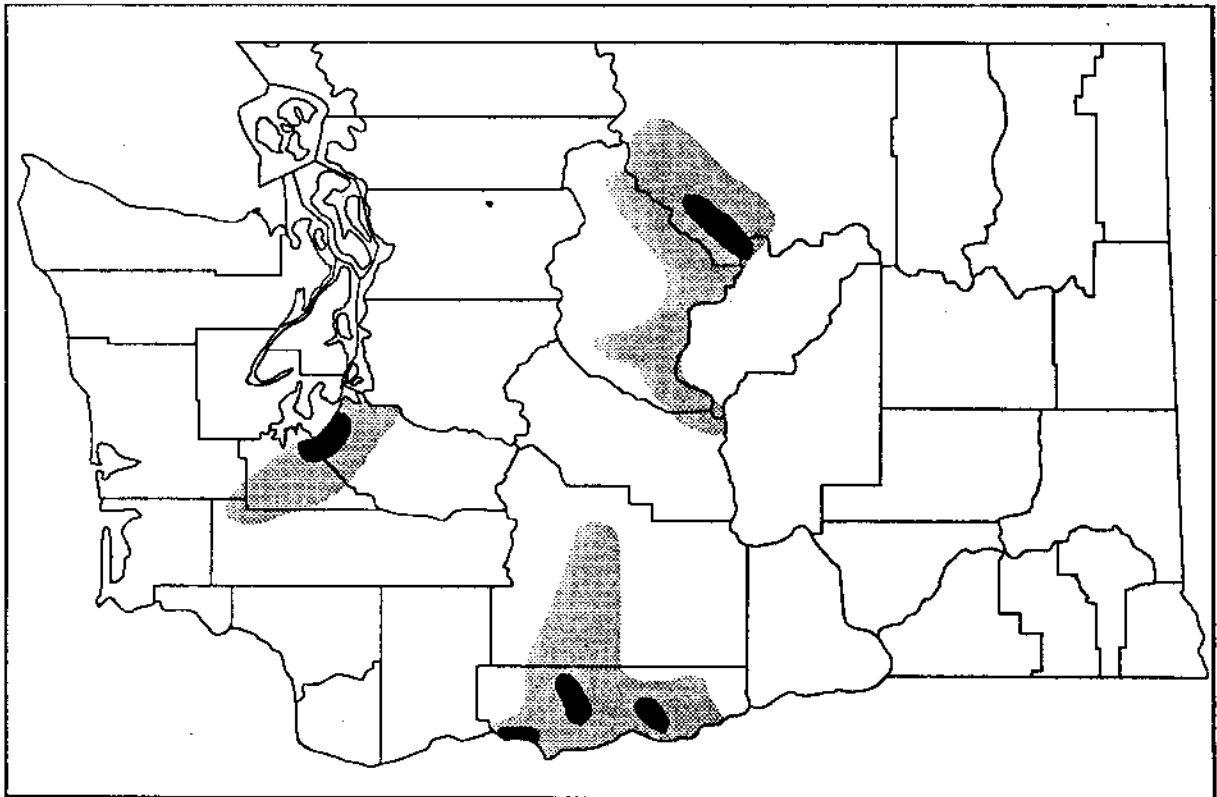


Figure 2. Historic (light shading) and approximate current (dark shading) distribution of the western gray squirrel in Washington.

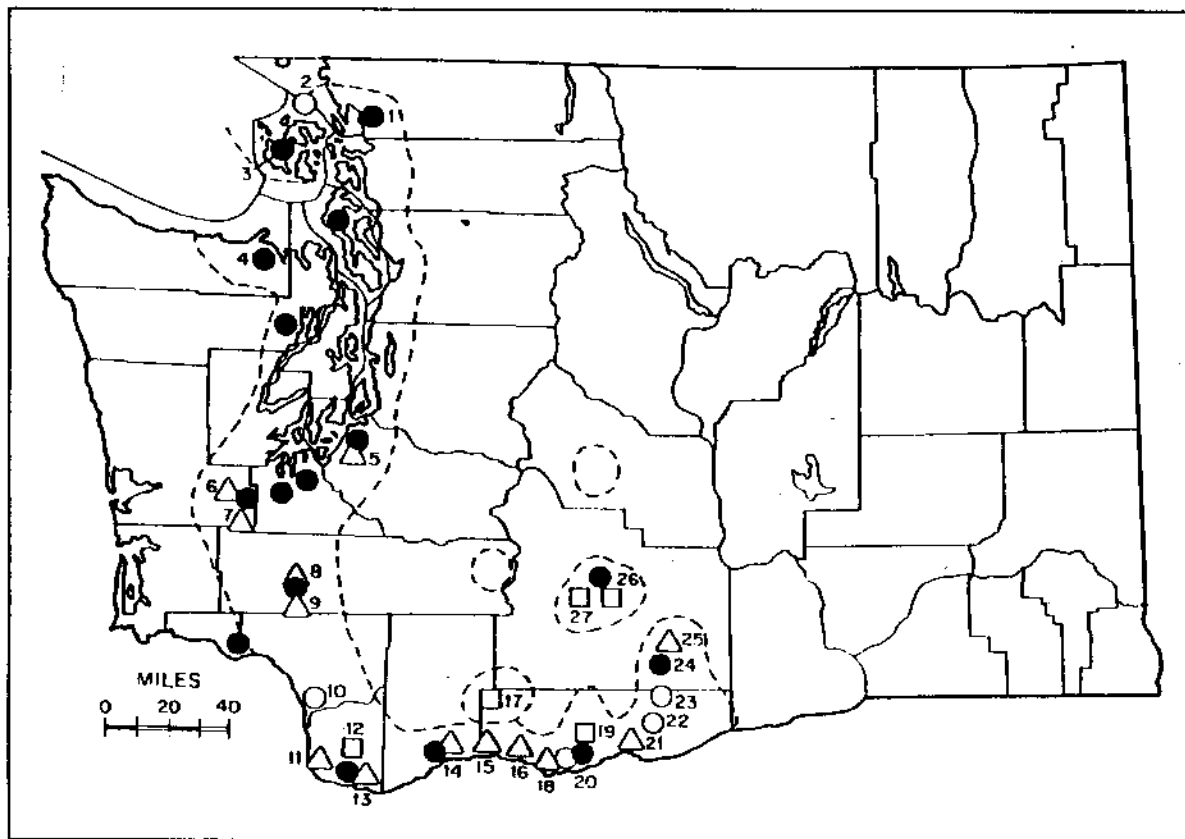


Figure 3. Historic Indian villages (closed circles) and range of Oregon white oak in Washington (broken lines), adapted from Taylor and Boss (1975). Numbers represent some Taylor and Boss study areas.

Table 2. Documented records of western gray squirrel (*Sciurus griseus*) in Washington.

Locality	County	Date	Source ^a	
			Museum	Reference
Lake Chelan	Chelan	pre-1947	BSC	Booth 1947
Lake Chelan		1948		Dalquest 1948
Lake Chelan		1953		Beuchner 1953
5-10 km E of Underwood	Klickitat	1938	PSM	
Cleveland		pre-1947	BSC	Booth 1947
10 km NE of Goldendale		pre-1947	BSC	Booth 1947
19 km N of Lyle		pre-1947	BSC	Booth 1947

continued on following page

Table 2 (continued)

Locality	County	Date	Source ^a	
			Museum	Reference
Trout Lake	Klickitat	pre-1947	BSC	Booth 1947
White Salmon		pre-1947	BSC	Booth 1947
Glenwood		pre-1947	CRCM	Booth 1947
8.3 km S of Bickleton		1978	CRCM	
0.8 km S of Gold Creek	Okanogan	1973	CRCM	
2.4 km N of Alta Lake		1974	CRCM	
Black Canyon (Methow River)		1977	CRCM	
Hurricane Canyon		1977	CRCM	
Black Canyon		1979	UWBM	
Black Canyon		1981	UWBM	
Methow		1984	UWBM	
Pierce County	Pierce	1886-1921		Bowles 1921
Spanaway		1924	CRCM	
Pierce County		1926		Couch 1926
Spanaway		1936	UWBM	
Spanaway		1938	UWBM	
Ft Lewis-Orchard Pond		1939	PSM	
Draper Lake		1939	PSM	
W Gravelly Lake		1939	PSM	
Tacoma		1939	UWBM	
Puyallup		pre-1947	BSC	Booth 1947
Roy		pre-1947	BSC	Booth 1947
Tacoma		pre-1947	BSC,UWBM,WCM	
Parkland		pre-1947	Lerass	
Spanaway		pre-1947	Slipp	
N Puyallup		1947	PSM	
Tacoma		1950	PSM	
American Lake		1950	PSM	
Spanaway		1950	PSM	
Spanaway		1951	PSM	
Spanaway		1952	CRCM	
Tacoma-Pt Defiance		1973	PSM	
Unspecified	Thurston	1926		Couch 1926
East Cascades	Yakima	1927		Couch 1927
Mt Adams		pre-1947	USNM	Booth 1947

^a Sources as follows: Thomas Burke Memorial Washington State Museum, Univ. Wash., Seattle (UWBM); Biological Survey Collection, USFWS, Wash. D. C. (BSC); Conner Museum, Wash. State Univ., Pullman (CRCM); H. J. Lerass, Univ. Michigan; J. W. Slipp, Tacoma; Slater Museum of Natural History, Univ. Puget Sound, Tacoma, Washington (PSM); U.S. National Museum, Wash. D.C. (USNM); Whitman College Museum, Walla Walla, Washington (WCM). Others are listed in References Cited.

NATURAL HISTORY

The western gray squirrel is generally thought to have habits similar to those of the eastern gray squirrel in their respective niches, but no genetic interchange would have been possible between these species until recently when eastern gray squirrels were introduced into western gray squirrel habitat. The Abert's squirrel and Kaibab squirrel (*Sciurus aberti kaibabensis*), which live in the southwestern United States, are similar to the western gray squirrel in nest tree selection, habitat utilization, and food habits (Foster 1992).

Behavioral Characteristics

The western gray squirrel prefers arboreal travel and is extremely wary and secretive. Even in areas where they are common, they can be difficult to see. This squirrel is diurnal and most active in early morning (Bowles 1921, Cross 1969, Barnum 1975, Gilman 1986). They are mostly silent except for a warning bark (a hoarse "chuff-chuff-chuff") heard most often from August to October (Maser 1981).

Nests are used year-round for shelter. Early authors indicated that the western gray squirrel generally nested in cavities but also built stick nests (Bailey 1936, Ingles 1947). Cross (1969), Barnum (1975), and Foster (1992) found primarily stick nests in Washington and Oregon. Some females who were pregnant or with young were found in cavities. Most squirrels built round stick nests. Loose platform, leaf "drays" were used for resting especially in summer. Except for nests with young, one squirrel occupied one nest. Sequential use of multiple nests was common. Foster (1992) often found cut branches on the ground under nest trees.

In a radiotelemetry study, Gilman (1986) found single western gray squirrels often used different stick nests sequentially, resting during the day in one and then switching to another at night. Sometimes they would trade nests with other squirrels. They often rested on tree limbs. B. Weiler (pers. comm.) has observed multiple species, including western gray squirrels, use cavities in the same oak tree at different times during a day. Perhaps use of cavities has declined with the logging of older trees and snags.

Foster (1992) did not observe cavity use and feels it is infrequent since there were aggressive competitors present such as Douglas and northern flying squirrels and birds. Western gray squirrels are passive by nature and do not compete well. She found these squirrels to be cautious in their approach to the nest, possibly to avoid predators and nest competitors. Instead of going from the ground directly to the nest, they would climb a distant tree and work their way through the canopy to their nest.

Behavior during the rutting season involves much chasing by both males and females and often the presence of one or more males near a female. Males are generally compatible during this period and often appear in small groups, but occasionally serious fights may

occur (Ingles 1947). Cross (1969) observed several males form a mating group and compete for one female.

Food

A California study (Stienecker and Browning 1970) determined the principal foods of the western gray squirrel by volume: hypogeous fungi, pine nuts, acorns, bay fruit, and green vegetation. Fungi were eaten year round, while pine nuts and acorns were the main summer and fall foods. The acorn and pine mast are considered critical to provide energy for overwintering.

In southern Oregon, Cross (1969) found that pine and fir seeds were used all year but became the predominant food in late summer and early fall. From late fall through winter, acorns were eaten. Subterranean fungi were a major portion of the spring and early summer diet but were probably used all year.

During an 8-year study in northern Oregon, Foster (1992) observed 4 years with poor acorn crops in Oregon white oak. The reason for the lack of production is unknown, but is characteristic of this species. In an ideal year, the annual diet of the western gray squirrel in northern Oregon is as follows: acorns from winter through early spring, succulent green herbs from late spring through early summer, hypogeous and epigeous fungi from early spring through late fall, and green pine cones and seeds from late summer through fall. The Washington side of the Columbia River Gorge is vegetatively similar to northern Oregon so these squirrels eat the same foods (Barnum 1975).

Since there is little pine in the southern Puget Sound area, the western gray squirrel probably relies on oak and other mast-producing species such as Douglas-fir (*Pseudotsuga menziesii*), hazel or filbert (*Corylus cornuta*), big-leaf maple (*Acer macrophyllum*), and vine maple (*Acer circinatum*) (Rodrick 1986). L. A. Ryan (pers. comm.) observed western grays eating green maple seeds and Gaulke and Gaulke (1984) saw them eat large quantities of immature aspen (*Populus tremuloides*) catkins.

In Chelan and Okanogan counties, where no oak occurs, the winter mast is believed to be supplied by domestic walnut trees and other mast-bearing plants (Barnum 1975).

Feeding Behavior

Most foraging occurs on the ground but cones are eaten in the trees. Clumps of needles from cone-cutting and narrow cone cores can be found under trees where feeding has occurred. Mast is cached and buried individually in the ground for winter. Hypogeous fungi (truffles) are dug from the ground year round. The squirrels move between vegetation types in response to food availability (Cross 1969, Stienecker and Browning 1970, Stienecker 1977, Foster 1992).

Damage to nut orchards by western gray squirrels was reported in California (Stienecker and Browning 1970) and Oregon (Bailey 1936). When mast is in short supply, this squirrel may damage conifers by girdling the branches and trunk near the tops of trees causing a candelabra type deformation. The squirrel seeks the rich cambium layer in winter and early spring when the sap is running (Bowles 1921, Barnum 1975). This phenomenon apparently occurs when there are high population numbers and more competition for food. Foster (1992), in an 8-year northern Oregon study, did not observe this activity. Any damage in local areas of Washington would be insignificant because population levels are low.

Home Range

Home ranges for the western gray squirrel under natural conditions vary from 0.2-6.5 ha (0.5-16 ac) (Table 3). Generally, the home ranges are smaller during late summer. Ingles (1947) found the smallest home ranges in a California park with abundant food which included exotic mast-bearing trees. Cross (1969) and Asserson (1974) each found one squirrel that moved great distances: 1.6 km (1 mi) and 9.6 ha (23.7 ac), respectively. In a northern California radiotelemetry study, Gilman (1986) found extensive overlap of home ranges, and felt that this was indicative of high quality habitat.

Cross (1969) concluded that home range varies with age, season, locality, and from year to year in southern Oregon. He attributed seasonal and annual variation to changes in food supply and population structure. Home range differences between populations may have reflected differences in habitat and population density. In northern Oregon, home ranges are significantly larger than those further south which may indicate marginal habitat quality. The larger home ranges could result from extensive competition with conspecifics and other species for food (Foster 1992).

In southern Washington, Barnum (1975) found small home ranges, possibly because of a concentration of food resources during the late summer and early fall study period.

Population densities vary throughout the range of the western gray squirrel (Table 3).

Table 3. Home range and density estimates for western gray squirrels.

Location	Home Range (ha)	Density (squirrels/ha)	Reference
Northern California	1.9-3.7	1	Gilman 1986
Southern Oregon	2.0-3.8		Cross 1969
Northern Oregon	1.7-6.5		Foster 1992
Southern Washington	0.2-0.47		Barnum 1975
California		2.5	Asserson 1974
California (park)	0.12-0.62		Ingles 1947

HABITAT REQUIREMENTS

General

Western gray squirrels need a variety of mast-producing trees and shrubs for food, cover, and nesting sites. A variety of types of mixed conifer-oak forests occur throughout the ecological range of the western gray squirrel. The species of conifer and oak vary considerably within the range. Generally, the squirrels require trees of sufficient size to produce an interconnected canopy for arboreal travel. Barnum (1975) observed no use of a lone pine tree that was full of green cones, conceivably because there was no travel cover available. The quality of the habitat is influenced by the number of mast-bearing tree species in and near the nest tree sites, the age and size of the trees, and proximity to permanent water (Cross 1969, Gilman 1986, Foster 1992). The western gray squirrel seems to be associated with late successional forests which provide the above-mentioned characteristics.

This squirrel inhabits three distinct vegetation types in three regions of Washington. In the southern Puget Trough white oak-Douglas-fir woodlands encircle the prairies. Small amounts of lodgepole pine (*Pinus contorta*) and relict stands of ponderosa pine (*Pinus ponderosa*) occur in this area. The prairie-woodland mosaic results from gravelly, well-drained soils and frequent burning by natural causes, Native Americans, and possibly early white settlers. With the advent of fire protection and grazing, Douglas-fir is invading the oak woodlands and prairies (Lang 1961, Franklin and Dyrness 1973).

In the Columbia River Gorge of south-central Washington, Oregon white oak-ponderosa pine forests prevail. These forests follow stream drainages northward toward Goldendale and into Yakima County (Franklin and Dyrness 1973). Other tree species of importance to the western gray squirrel are Douglas-fir, which appears as elevation increases, and introduced nut trees which were planted in agricultural areas (Barnum 1975).

In Chelan and Okanogan counties squirrels are found in the grand fir-Douglas-fir zone, typically in densely vegetated valleys near water. These valleys also have significant amounts of ponderosa pine. Groves of English and black walnut, planted during the 1940's and 50's, may have aided the expansion of the western gray squirrel into this region (Barnum 1975).

Breeding Habitat

Most squirrels build round stick nests, approximately 60 cm (2 ft) in diameter, in pole to sawtimber-sized conifers, about one third of distance from the top of the tree and next to the trunk. The nests are lined with lichen, moss, and bark shavings.

Foster (1992) found that the most important components of nest tree sites in north-central Oregon, were contiguous canopy cover (mean = 60%) to allow aerial travel, and being within 180 m (600 ft) of water. Nest tree age (69-275 yr, mean = 108 yr) and diameter at breast height (21-58 cm, mean = 40 cm; 8.2-22.6 in, mean = 15.7 in) appeared to be the most important determinants of the tree chosen. All nest trees in the study area were ponderosa pine, except one Douglas-fir. Typically, one of the quadrants surrounding the nest tree had a more open canopy, frequently facing a meadow, road, creek, or other opening (Foster 1992). These nest site characteristics are probably similar to the habitat on the Washington side of the Columbia River. On Fort Lewis, Ryan (1992) has found most stick nests in Douglas-firs associated with white oak communities.

Seasonal Habitat

Maser (1981) suggested that during wet coastal winters this squirrel probably takes shelter in cavities or hollows.

POPULATION DYNAMICS

Reproduction

Data from population studies suggest nearly equal numbers of males and females in western gray squirrel populations (Cross 1969, Barnum 1975, Foster 1992).

Most researchers believe that western gray squirrels produce one litter per year with some females breeding much later than others. This squirrel breeds from December through July with two reproductive peaks producing litters in spring or summer (Bailey 1936, Ingles 1947, Cross 1969, Asserson 1974, Byrne 1979, Gilman 1986, Foster 1992). The gestation period is 44 days with 2-5 young born from March through June. May is the earliest month that juveniles emerge from nests.

Mortality

Longevity in the wild is probably 8-10 years, similar to that of the fox and eastern gray squirrels.

The western gray squirrel has many potential predators in Washington: red-tailed hawk (*Buteo jamaicensis*), great-horned owl (*Bubo virginianus*), golden eagle (*Aquila chrysaetos*), goshawk (*Accipiter gentilis*), bobcat (*Felis rufus*), coyote (*Canis latrans*), cougar (*Felis concolor*), and domestic dogs and cats (Cross 1969, Asserson 1974, Barnum 1975, Foster 1992).

Outbreaks of the disease Notoedric Mange or scabies from 1913 to 1921 and in the 1930's reached epidemic proportions among western gray squirrels and decimated many populations throughout much of this species range. Most populations recovered but the disease is still present (Ingles 1947, Cross 1969). Gilman (1986) recorded an unknown form of dermatitis which left a bare stripe on squirrel backs, unlike the patchiness of scabies. Some authors have attributed cyclic population fluctuations to disease (Cross 1969), and small populations may not rebound from such epidemics. Other diseases include coccidiosis and viral equine encephalomyelitis, and parasites include fleas, ticks, mites, intestinal round worms, and ringworm (Ingles 1947, Cross 1969).

Western gray squirrel road kills have been documented as a problem on the Oak Creek Wildlife Area in Yakima County (Gaulke and Gaulke 1984) and northeast of Lyle in Klickitat County (B. Weiler, pers. comm.).

This squirrel was hunted until 1943. The Washington Department of Wildlife 1943 Hunting Pamphlet listed a season on black and gray squirrels from 10-31 October, in Clark, Cowlitz, Klickitat, Lewis, Pierce, Skamania, and Thurston counties. The bag limit was 5 squirrels/day, straight or mixed species. A special season was opened in 1949 to reduce squirrel damage to Douglas-fir near Yelm, Thurston County. However, the season was unsuccessful and did not alleviate the damage problem (Barnum 1975). While hunting of tree squirrels is now illegal in Washington, western gray squirrels are probably being killed when mistaken for the California or Beechey's ground squirrel (D. Morrison, pers. comm.).

The western gray squirrel is a hunted species in Oregon. Foster (1992) found that the adults killed included lactating females whose young may not survive. Continued ill-timed hunting may affect long-term population levels.

POPULATION STATUS

Past

Little information is available on historic population levels for the western gray squirrel in Washington. Bowles (1921) noted that this squirrel was one of the most abundant mammals in the Northwest.

Long-term studies of the eastern gray squirrel show years of acorn mast failure followed by cessation of reproduction. Both fox and eastern gray squirrels are capable of compensatory breeding at high rates, with two litters per year, in times of low population density and food abundance. Western grays do not appear to be capable of higher rates of reproduction (Byrne 1979). When other factors like disease or competition are present, the western gray is more vulnerable to population crashes.

Southern Puget Sound. Bowles (1921) said western gray squirrels were uncommon in Pierce County from 1896 until 1920. He noted that the squirrels were protected in 1910 and that by 1921 their numbers had increased to the point where they were doing significant stem damage to fir trees. Booth (1947) reported that western grays were common in western Pierce County. In 1949 significant tree damage was reported again for the Fort Lewis area of Pierce County (Barnum 1975). Since little tree damage has occurred in the ensuing 40 years, the local gray squirrel population may not have peaked since 1950, and now could be at a critically low level which prevents it from responding to good mast crops (Rodrick 1987). Western gray squirrels were seen in southern Thurston County until the late 1970's.

Columbia River Gorge. Lewis and Clark (Thwaites 1904) described western gray squirrels as locally abundant in the Columbia River Gorge. Local residents reported more western gray squirrels prior to the invasion of the California ground squirrel into the gorge in the 1920's. It is suspected that the ground squirrel competed for food and transferred mange to this population which caused a decline in western gray squirrels (G. Brady, pers. comm.). Since 1973, D. Morrison (pers. comm.) has observed several western grays each year during the course of normal duties on the Klickitat Wildlife Area. The western gray squirrel is uncommon here. The population is small but seems to have been stable during the past 20 years.

Yakima County. Booth (1947) described the western gray squirrel as uncommon in the southern Cascade Mountains. Old-timers near Tampico, Ahtanum Creek, remember seeing gray squirrels until the early 1950's. A retired Department of Wildlife biologist reported that western gray squirrels were abundant in the Ahtanum and Cowiche creek drainages and less common along Oak Creek prior to the 1950's. A hunting season existed until populations were decimated from a mange epidemic in the 1940's and 1950's (Stream 1993).

The population of western gray squirrels on the Oak Creek Wildlife Area in Yakima County declined drastically from mange by the 1950's. The Department of Wildlife reintroduced 10 squirrels from Oregon during 1970-71, but the population failed to increase and remained low for 20 years. The failure of this reintroduction was attributed to high disturbance during the breeding season, road kills, competition from ground squirrels, predation from raptors and coyotes, indiscriminate hunting, poor mast crops, and poor oak regeneration due to grazing by elk (Gaulke and Gaulke 1984).

The last sighting of a western gray squirrel on Oak Creek Wildlife Area was in 1989. A 1991 survey found California ground squirrels and Douglas squirrels in both oak woodlands and mixed conifer habitats, but no western grays were observed (Stream 1993).

Chelan and Okanogan counties. No information is available on past population numbers or trends.

Present

The four disjunct populations of western gray squirrels in Washington appear to have been isolated for some time. The Yakima County population may be extirpated. The Puget Sound and Chelan/Okanogan populations are small, isolated, and vulnerable to habitat changes and random events that can cause local extirpations.

Southern Puget Sound. Based on a survey of historic western gray squirrel sites during 1985-86, the last remnant population in southern Puget Sound is on the Fort Lewis Military Reservation (Rodrick 1986).

In a current study of the Fort Lewis population, Ryan (1992) observed approximately 47 live individuals and 11 dead squirrels while surveying 68% of the oak and oak-conifer stands on Fort Lewis. Approximately 75% of oak areas surveyed meet some minimum standards for habitat suitability for western gray squirrels. These standards include oaks of mature size, proximity to Douglas-fir, and proximity to water. There are approximately 1440 ha (3600 ac) of oak and oak-conifer forests on Fort Lewis. If 58 western gray squirrels were seen on 68%, or 980 ha (2450 ac), then a rough estimate for the total population is about 85 squirrels. This estimate is based on the assumption that 75% of the remaining 460 ha (1150 ac) of oak and oak-conifer habitat is suitable for western grays.

Army maneuvers do not appear to be a detriment to western gray squirrels. Western grays have consistently been seen in areas of high military use. Many western grays have been seen in artillery safety zones where disturbance from people and vehicles is relatively low (L. A. Ryan, pers. comm.).

Columbia River Gorge. The western gray squirrel appears to be widely distributed across Klickitat County, but populations are localized. Residents have noticed a decline of western grays in this county (Rodrick 1986). Recent records indicate that western gray squirrels are present in four drainages within the Columbia Gorge: the Klickitat River and Catherine, Major, and Rock creeks. No information is available on population numbers or habitat connectivity.

Foster (1992) documented a decline in a population on the Oregon side of the Gorge from 1981 to 1989. She correlated the decline with inclement weather and the loss of both major mast crops, pine seeds and acorns, during 1983-84. The absence of these foods prevented accumulation of winter fat and the squirrels became stressed. Scabies erupted, further weakening the squirrels, and many died from hypothermia and/or starvation. The population may have recovered within a few years, but accelerated logging of habitat and hunting while females were still nursing young have kept the numbers low. This scenario may be playing out in Washington as well.

Yakima County. The population at Oak Creek may be extirpated and little is known about the occurrence of this squirrel on the Yakima Indian Reservation. Yakima Indian Nation tribal members say there are western gray squirrels on the reservation but tribal biologists have not yet confirmed this (B. Weiler, pers. comm.).

Chelan and Okanogan counties. This population may be fragmented and limited by availability of suitable habitat. The mast-producing orchards which may have been responsible for their northern expansion have been converted to non-mast producing fruits. These squirrels are isolated from populations in other parts of the state and are quite vulnerable.

Future

Southern Puget Sound. The remnant Fort Lewis population is isolated. There are other fragmented islands of oak-conifer habitat in the southern Puget Trough but corridors for migration and dispersal are disappearing. In addition, this population is widely separated from the nearest population in Klickitat County. Opportunities for dispersal and maintenance of populations are restricted because of habitat fragmentation. The long-term outlook for this population is unfavorable.

Columbia River Gorge. Further survey effort is needed to determine the extent and health of this population, the extent of habitat fragmentation, and whether the population is localized or widespread. This population may have the best chance of long-term survival because of some large areas of contiguous habitat and the possible existence of multiple population centers.

Chelan and Okanogan counties. This population is highly vulnerable and may not persist without active management.

HABITAT STATUS

Since extinction or extirpation rates are partly area-dependent, the size of reserves, spacing of reserves, and dispersal corridors are important. Individual reserves must be large enough to ensure stability of the ecosystem and to provide a buffer from disturbance (Frankel and Soulé 1981).

Oak was more common in Washington 10,000 years ago, before a long-term climatic change (Kertis 1986). The western gray squirrel was probably more widely distributed in prehistoric times and has diminished recently along with the oak woodlands (Rodrick 1986). Presently, both the oak and the squirrel are at the northern extent of their ranges in potentially marginal habitat.

Southern Puget Sound. Comparison of aerial photographs from the early 1950's with recent ones of the Puget prairies reveals a reduction in or disturbance to western gray squirrel habitat, the oak woodlands and oak-conifer forests which surround the prairies (Rodrick 1986). Early habitat alterations included removal of oak for firewood, agricultural clearing, grazing, and fire suppression (Lang 1961, Franklin and Dyrness 1973, Kertis 1986).

On Fort Lewis, Macklin and Thompson (1992) documented a widespread decline in the oak population because of poor oak regeneration, poor acorn production, and competition mortality from oaks being overtopped by conifers in many of the mixed stands. Forestry practices used to facilitate army training may benefit the squirrels. Thinning is used to increase spacing of Douglas-fir while maintaining forest cover, including oak stands. The resulting mixed-species, oak-fir forest seems to be preferred by western gray squirrels. Army maneuvers, including bivouacking, in some of these stands may maintain their open character through suppression of shrubs and seedlings. Since oak regeneration is poor, special management may be needed to regenerate oak trees (L. A. Ryan, pers. comm.).

Although the possibility of expansion of military facilities exists, military ownership and management may be beneficial because of restricted access, management for biodiversity, and management for sensitive plants and animals including oak communities and western gray squirrels. The Army is presently taking an active role in preserving habitat for the western gray squirrel (L. A. Ryan, pers. comm.).

It is questionable whether Fort Lewis has enough oak-conifer forest to maintain a viable population of western gray squirrels over the long-term. A catastrophic event might extirpate the species from this area.

Columbia Gorge. Across the Columbia River in north-central Oregon, the harvest of the large, old oaks and ponderosa pines depletes the best mast-producing trees. Western gray squirrels disappear from areas that have been clearcut but persist in selectively cut areas if enough trees are left to produce mast and permit arboreal travel. Grazing and conversion of oak woodlands to conifer plantations precludes regeneration of oak forests. Since the western gray squirrel is dependent on oak and pine for food, cover, and nesting, any significant habitat loss would lead to rapid population declines (Foster 1992).

In the Columbia River Gorge of south-central Washington, the main causes of habitat alteration are conversion of mixed oak-conifer stands to conifer monocultures, uncontrolled firewood cutting, overgrazing, insects and disease, and fire suppression which allows conifer invasion of oak woodlands and fuel-loaded, hot wildfires which kill oak and pine (Columbia Gorge Audubon Society 1992). There was essentially no acorn crop in the entire Columbia Gorge in 1991, and an insignificant crop in 1992 (B. Weiler, pers. comm.).

CONSERVATION STATUS

Legal Status

The western gray squirrel is classified as Protected Wildlife under Washington Administrative Code 232-12-011. Individual animals cannot be hunted, harassed, held in captivity (live or dead), or sold, nor may their nests be destroyed (RCW 77.16.120 and WAC 232-12-064, 067, 287).

In Oregon, the western gray squirrel is classified as a hunted species.

Management Activities

The western gray squirrel has been treated as a species of concern in Washington State since 1980, when the Department of Wildlife Nongame Program created its first Species of Concern List. This list provided some management emphasis to the species. In 1991, Director Curt Smith signed Policy 4802 which established a list of State Candidate Wildlife Species, species that are under review for possible inclusion on the state's lists of endangered, threatened, and sensitive species.

The western gray squirrel is a Priority Species and oak woodland is a Priority Habitat under the Department of Wildlife's Priority Habitats and Species Program. This program uses Geographic Information Systems technology to store locational information on special species and habitats. This information is made available to agencies, local governments, and others, primarily to facilitate habitat protection and compliance with Washington's Forest Practices and Growth Management Acts. Habitat Management Recommendations are provided along with the site-specific information. Local governments must adopt regulations to protect critical fish and wildlife habitats. It is too early to tell how effective local governments will be in regulating development to protect habitats for priority species.

The populations in south Puget Sound and Yakima County are largely on public land while those in the Columbia Gorge and Chelan and Okanogan counties are mostly on private land.

Biologists on the Fort Lewis Military Reservation have contracted with the U.S. Forest Service Pacific Northwest Forest Sciences Laboratory to study the reservation's western gray squirrel population and recommend a management strategy. During the interim, Army foresters are managing for retention of oak woodland habitat and large oaks and pines. If the western gray squirrel retains its federal "sensitive" status, it is unlikely that the military would destroy its habitat. Most federal land management agencies recognize state-listed species by placing them in an administrative "sensitive" category and consider them in land and resource management activities.

The Department of Wildlife manages approximately 7,000 ha (17,300 ac) of oak woodlands and oak-conifer forest at Scatter Creek, Oak Creek, and Klickitat Wildlife Areas. Draft management guidelines are proposed to retain and enhance western gray squirrel habitat and oak-conifer woodlands (M. Beckstead, pers. comm.).

The U.S. Forest Service, in the Columbia River Gorge National Scenic Area, manages a significant amount of western gray squirrel habitat. This species is on the Regional Forester's Sensitive Species List and is a Management Indicator Species for the oak-pine community. This status gives a directive to review and modify land uses, where necessary, to provide some protection for the species. The Columbia River Gorge Scenic Area Plan lists the western gray squirrel as a sensitive species and requires some protection of occupied habitat.

Most western gray squirrel habitat in Washington is in private ownership. Often the removal of oak trees for firewood or to build houses does not require a permit. A forest practice involving removal of more than 5,000 board feet of timber requires a State Forest Practices Permit. These forest practice applications are screened by computer query to identify important features that may be affected by the proposed practice. The Department of Wildlife is contacted only when a threatened or endangered species is involved. No mitigation is required for candidate species.

Western gray squirrels do not occupy nest boxes (Foster 1992), so this enhancement technique is unlikely to aid population recovery.

During 1970-71, WDW attempted a reintroduction of western gray squirrels from Oregon to the Oak Creek Wildlife Area in Yakima County. The population failed to increase for 20 years which was attributed to high disturbance during the breeding season, road kills, competition from ground squirrels, predation from raptors and coyotes, indiscriminate hunting, poor mast crops, and poor oak regeneration due to grazing by elk (Gaulke and Gaulke 1984).

FACTORS AFFECTING CONTINUED EXISTENCE

Adequacy of Existing Regulatory Mechanisms

The Wildlife Code of the State of Washington provides no habitat protection for the western gray squirrel; currently, habitat protection for this species is merely advisory. As a candidate for listing at the state level, the western gray squirrel is afforded only the lowest level of concern and protection, but the species is included in several important habitat management programs and lists, such as the Department of Wildlife's Priority Species List, the Regional Forester's Sensitive Species List, and the Columbia River Gorge Plan. Most western gray squirrel habitat is on privately-owned lands, so County Comprehensive Land

Use Plans and local regulation under the Washington Growth Management Act may serve as vehicles to protect habitat for this species. However, some local jurisdictions are choosing to regulate only activities affecting listed species and the degree of protection is highly variable.

The current Protected Wildlife classification of the western gray squirrel may also not be adequate. Since the western gray squirrel resembles the unprotected California ground squirrel, it is probably taken mistakenly by ground squirrel hunters. Some areas may need to be closed to all squirrel hunting.

General

Populations at the farthest extent of a species' range often occupy marginal habitat, and exhibit low numbers and sporadic distribution. As a result, populations of such species are easily stressed, generally less productive, and more vulnerable to environmental changes. The three main requirements for long-term population viability are: 1) sufficient habitat and protection from disturbance to maintain a population; 2) opportunity for genetic interchange between populations; and 3) a population large enough to ensure genetic conservation (Frankel and Soule 1981).

Interspecific Relationships

Native competitors of the western gray squirrel for food, especially the critical large mast, include Beechey's or California ground squirrel, Douglas' squirrel, northern flying squirrel, chipmunks (*Tamias* spp.), Lewis' woodpecker (*Melanerpes lewis*), Steller's (*Cyanocitta stelleri*) and scrub jays (*Aphelocoma coerulescens*), crows (*Corvus brachyrhynchos*), porcupines (*Erethizon dorsatum*), woodrats (*Neotoma* spp.), jackrabbits (*Lepus* spp.), and skunks. Game species include the black-tailed deer (*Odocoileus hemionus columbianus*) and the introduced Merriam's turkey (*Meleagris gallopavo*). Other tree squirrels and woodpeckers are more aggressive than the western gray and compete with the western gray for cavity nests (Barnum 1975, Cross 1969, Foster 1992). Cross (1969) found that during a period of food shortage a western gray squirrel population decreased while the ground squirrel population increased. He speculated that competition may have played a role.

According to long-time residents in Klickitat County, there has been a decrease in western gray squirrels and an increase in California ground squirrels (D. Morrison, pers. comm.). The ground squirrel was first seen in Washington in 1912 at Bingen and White Salmon (Booth 1947). Then it rapidly increased after construction of dams and bridges across the Columbia River. By 1960 it had moved northward to Naches in northern Yakima County (Broadbrooks 1961). Foster (1992) reports that both species use acorns and pine seeds in fall and winter, and hypogeous fungi year round. The ground squirrel is more aggressive than the western gray, often chasing it away. It is suspected that when California ground squirrels invaded Washington, they competed for food and transferred mange to western grays causing a population crash (G. Brady, pers. comm.). Western grays have co-existed

with California ground squirrels for some time in northern Oregon. However, since western gray squirrels are at the northern extent of their range in Washington, they may be more vulnerable to increased competition and disease brought by the ground squirrel, especially if combined with severe weather and habitat loss.

Byrne (1979) studied interactions of the introduced fox and eastern gray squirrels with the western gray in California. She believed they did not cause a major displacement of the western gray squirrel, but in several riparian areas they replaced the western by sheer force of numbers. The introduced squirrels were opportunistic feeders, but relied more on nut orchards than native foods. During good crop years in moist areas the introduced squirrels maintained a twice yearly breeding cycle, while the western was unable to respond to the plentiful food from nut orchards by producing a second litter. The fox and eastern gray squirrels were most successful in disturbed areas, orchards and suburbs, although they did survive in natural communities. Since the introduced squirrels generally do not use cones or hypogeous fungi, they did not occupy the coniferous habitats used by the western gray squirrel. Nor were they as tolerant of drier woodlands. Byrne speculated that under these conditions they may be unable to produce a summer litter, and thus, lose their advantage over the western gray squirrel.

Eastern gray squirrels were introduced within the range of western grays in Pierce and Thurston counties, but they do not appear to be displacing the western gray squirrel in the Puget Trough. Western gray squirrels remained in suburban Tacoma during the early 1950's, but seemed to move out with increasing residential development. Also, as suburban areas developed the introduced eastern gray squirrels moved south from a Tacoma city park to Olympia into areas that used to be occupied by westerns (M. Johnson, pers. comm.).

Western gray squirrels appear to be less tolerant of people and development than eastern gray squirrels or cannot adapt to alternate food resources (Byrne 1979). The circumstances at a Thurston County site seem to support this observation. Residents of a Lacey subdivision who built homes in 1981 in an oak grove reported seeing western gray squirrels when they first moved there, but the squirrels soon disappeared. In 1984, eastern gray squirrels arrived. It appears that the western grays moved out of the area when development occurred. As soon as the eastern gray squirrels migrated far enough south, they occupied the area. Residents are now feeding these squirrels. As in a California study area, it appears that the eastern gray squirrel has replaced rather than displaced the western gray squirrel at the Lacey site. This recent range contraction of the western gray squirrel in southern Puget Sound seems to have occurred because of habitat alteration rather than competition from the eastern gray squirrel (Rodrick 1986). A few eastern gray squirrels were trapped with western grays in the outback of Fort Lewis, the last stronghold for western gray squirrels in Puget Sound (Ryan 1992).

Present and Threatened Habitat Loss

The western gray squirrel is one of 93 species associated with late successional (large sawtimber and old-growth) forests in the Pacific Northwest. Less than 20% of the original Pacific Northwest old-growth forest remains and 50% of this remainder is planned for harvest by 1993 (Lehmkul and Ruggiero 1991).

In an assessment of the effects of forest fragmentation on wildlife diversity and population viability, Lehmkul and Ruggiero (1991) rated the western gray squirrel at high risk of local extinction. Such animals of medium size and moderate vagility are at greater risk from diminishing habitat patch sizes because of the greater energy demands of larger body size. Persistence for these species is a balance between decreasing patch sizes and increasing isolation.

Marcot and Holthausen (1987) state that habitat fragmentation may isolate populations, making them more susceptible to inbreeding depression, which may decrease overall reproductive rates and fitness and increase susceptibility to poor environmental conditions. Local extinctions from low juvenile survival rates may result from these circumstances.

The trend of habitat loss in southern Puget Sound is accelerating with most of the privately-owned oak woodlands being converted to housing developments. Most of the rural habitat is being grazed, resulting in damage to old oaks and little oak regeneration (Rodrick 1986).

On private lands in the Columbia Gorge, current impacts to western gray squirrel habitat including conversion of oak-conifer woodlands, uncontrolled firewood cutting, fire suppression, and overgrazing, show little sign of relief.

Significant alteration of squirrel habitat in the east slope Cascade Mountains could extirpate these precarious populations.

Other Natural and Manmade Factors

Prehistoric climate change probably restricted and fragmented the distribution of oak and western gray squirrels. Today, the factors of competition, disease, and hunting may be more significant in the recent decline of the western gray squirrel than habitat loss in some areas. Also these factors may be more difficult to control than habitat loss.

Foster (1992) predicts that continued ill-timed hunting, together with habitat loss and altered weather patterns will have profound effects on population size, stability, and genetic viability in northcentral Oregon. These same factors may be at work in Washington populations.

CONCLUSIONS AND RECOMMENDATION

The first step to extinction is a reduction in population size from natural or human causes. Continuing decline and extirpation of the population can occur from intrinsic factors, such as variation in birth and death rates and sex ratios, and extrinsic factors including species interactions, severe weather, catastrophes, pollutants, habitat loss, and human disturbance (Soulé 1986).

To recommend a state status for the western gray squirrel, the following factors were assessed and conclusions drawn.

Prehistoric climate change probably caused a widespread reduction in both the oak woodlands and the associated western gray squirrel populations. Recently, the western gray squirrel appears to have decreased from historic population levels and shows no indication of recovery. These squirrels have an intermediate reproduction rate. Also, two out of three extant populations are small with limited potential for genetic mixing.

Factors that are likely to exert adverse effects on this species include: disease, interspecific competition, predation, and human disturbance. Historically, local population declines are part of a dynamic process of local extirpation and eventual recolonization. Today, the western gray squirrel's ability to rebound from unfavorable periods may be reduced.

There has been a recent reduction in and fragmentation of suitable habitat and this trend is increasing. The oak-conifer habitat naturally regenerates, but it is limited in extent and human intervention (fire suppression, logging, and grazing) is reducing it further.

Current regulations and plans are not adequate to protect habitat for the western gray squirrel. Some future habitat protection may occur in the Columbia Gorge Scenic Area for areas of known squirrel use, but this may not be enough to maintain a viable population. Also, little funding is available for surveys to identify currently active habitat.

As a result of these conditions, the western gray squirrel is in danger of extirpation from most of its range in Washington. There is a possibility that the Columbia Gorge population, may be strong enough to prevent the western gray squirrel from becoming an endangered species. It is recommended that the western gray squirrel be designated a threatened species in Washington.

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Appendix A

Reliable Observations of Western Gray Squirrel (*Sciurus griseus*)
in Washington, 1940 to Present

Appendix A. Reliable observations of western gray squirrel (*Sciurus griseus*) in Washington, 1940 to present (Wash. Dept. Wildl., unpubl. data).

Locality	County	Date	Source
Stehekin Ranger Station	Chelan	1969-92	North Cascades Natl. Park
Stehekin Road		1969	"
Rainbow Falls		1973	"
Rainbow Creek Trail		1978	J. A. Barrett
Stehekin		1970	J. Patterson <i>in</i> Barnum 1975
Navarce Coulee		1968	"
Sunnyslope		1967	"
Tumwater Canyon		1966	"
Ribboncliff Canyon		1964	"
Swakane Canyon		1966	"
Steiliko Canyon		1967	"
Purteman Gulch		1966	"
Roaring Creek		1969	"
Sanders Canyon		1969	"
Byrd Canyon		1967	"
Eagle Creek		1964	"
Goldfish Lake		1965	"
South Antilon Lake		1969	"
Grade Creek		1968	"
25-Mile Creek		1972,75	"
Knapp Coulee		1969	"
Johnson Creek		1969	"
Oklahoma Gulch		1969	"
Oklahoma Gulch		1973	Wash Dept. Wildl.
Chelan Butte		1960's	J. Patterson
Joe Creek		1988	D. Gomez
Grade Creek Road		1989	"
Manson		1992	D. Thompson
Oakville	Grays Harbor	1973	Wash. Dept. Wildl.
Tarpiscan Creek	Kittitas	1966	J. Patterson <i>in</i> Barnum 1975
Rock Creek	Klickitat	1948	F. White <i>in</i> Barnum 1975
Rock Creek		1979	R. Knight
Rock Creek		1985	R. Kavanaugh
Rock Creek		1986	D. Morrison and P. Miller
Rock Creek		1987	T. Clausing
Rock Creek		1992	L. Cornelius and F. Krause
Confluence of Rock and Squaw creeks		1992	R. Kavanaugh

continued on following page

Appendix A (continued)

Locality	County	Date	Source
Husom	Klickitat	1989	R. Kavanaugh
Horseshoe Bend		1949	F. White <i>in</i> Barnum 1975
Horseshoe Bend		1986	E. A. Rodrick
Wahkiacus Heights		1949	F. White <i>in</i> Barnum 1975
Wahkiacus Heights		1986	E. A. Rodrick
Wahkiacus Heights		1992	L. Cornelius
Wahkiacus Heights		1992	D. Morrison
Dalles Mountain		1969	F. White <i>in</i> Barnum 1975
Valley 16 km E of Goldendale		1974	Barnum 1975
Valley 65 km E of Goldendale		1974	Barnum 1975
Hwy 97, 11 km N of Goldendale		1975	R. Knight
Silva Creek		1983	D. Barci
Silva Creek		1988	J. Zarnowitz
Klickitat River, S Grayback Mtn		1986	D. Morrison
Klickitat River, Leidl Campground		1986	"
Glenwood Hwy and Soda Springs Rd		1986, 92	"
W Canyon Creek		1992	"
E Canyon Creek		1991,92	"
Counts Lane		1992	"
Sheep Canyon		1990	"
Major Creek		1989	R. Kavanaugh
W Fork Major Creek		1992	R. Dobson
Lyle, 5-6 km NE Centerville Rd		1992	B. Weiler and R. Kavanaugh
Michigan Hill	Lewis	1976	WDW
Lake Creek		1990	Steele and Lottsfeldt
Black Canyon Creek and Methow R	Okanogan	1965, 1972	J. Patterson <i>in</i> Barnum 1975
Black Canyon Creek and Methow R		1980	V. Marr
Black Canyon Creek and Methow R		1981	G. Van Lom
Black Canyon Creek		1972,77,79	G. Brady and V. Marr
Hurricane Canyon and Methow		1977	G. Brady
Early Winters Creek		1969	J. Patterson <i>in</i> Barnum 1975
McFarland Creek		1969, 1972	"
Gold Creek		1969	"
Alta Lake		1969	"
Libby Creek		1969	"
Buttermilk Creek		1969	"
Brewster		1970	"
Rat Lake		1970	"
Rat Lake		1972,75,79	V. Marr

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Appendix A (continued)

Locality	County	Date	Source
Squaw Creek	Okanogan	1969	J. Patterson <i>in</i> Barnum 1975
Squaw Creek		1992	G. Brady
Methow R, 1.6 km N of McFarland Creek		1977	V. Marr and G. Brady
Methow R, 5 km NE Pateros		1979	Shenyer
Methow R and Pete's Creek		1980	G. Brady
Methow R, Winthrop		1976,77	C. West
Methow R, Klipchuck Campground		1981	D. McNett
Twisp R, Mystery Campground		1987	V. Marr and L. Poole
Methow R., 1.6 km N Squaw Creek		1992	G. Brady
French Creek		1992	G. Brady
McKenna	Pierce	1969	Wash. Dept. Wildl.
Nisqually River		1972	"
Tacoma		1972	"
Chambers Creek Road		1972	"
S Tacoma Game Farm		1972	"
Fort Lewis		1972	"
Western State Hospital		1972	"
Fort Lewis Golf Course		1972	E. Mericle
Nisqually R-Military Rd		1972	E. Mericle
Nisqually River Rd		1986	G. Walter
Western State Hospital		1972, 75	C. Chappell
American Lake-Veterans Hosp		1974	Barnum 1975
American Lake-Verterans Hosp		1978	W. Wilkins
Fort Lewis, 8 sites w/squirrel		1972-74	Fort Lewis Staff
Fort Lewis, 4 sites		1974	"
Fort Lewis, 6 sites		1975	"
Fort Lewis, 9 sites		1976	"
Fort Lewis, 7 sites		1977	"
Fort Lewis, 2 sites		1978	"
Fort Lewis, 7 sites		1986	"
Fort Lewis, 3 track sites		1986	E. A. Rodrick
Fort Lewis, 47 squirrels		1992-93	L. Ryan
Fort Lewis-Lewis Lake		1986	G. Walter
Fort Lewis-Clover Creek Wetland		1991	R. Storee
Fort Lewis, 4 sites		1990	G. Walter
Fort Lewis		1990	R. Crawford
Fort Lewis	Thurston	1975,76	Fort Lewis Staff
Fort Lewis-Fiander Lake		1972	E. Mericle
Waldrick Rd		1956	D. Shultz
Welrick Road		1974	WDW Staff <i>in</i> Barnum 1975

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Appendix A (continued)

Locality	County	Date	Source
McAllister Springs	Thurston	1972	WDW Staff <i>in</i> Barnum 1975
Gate		1972	"
Lake St Clair		1972	"
Rochester		1972	H. Brent
Tenino, 3.2 km N on Hwy 99		1954-74	M. Thorniley
Scatter Creek Wildlife Area		1978	R. Knight
Scatter Creek Wildlife Area		1983	H. Hartwell
Yelm Hwy		1985	H. Hartwell
McAllister Creek and Steilacoom Rd		1981	C. Chambers
Hogum Bay Rd		1981	J. Davis
N Lake St Clair		1980	J. Patterson
Meridian and Mullen Rd		1981	G. Strickland
Tampico	Yakima	pre-1940	W. Mondor
Tampico		1940	J. Thornton
Ahtanum Guard Station		1949-50	B. Mondor
Ahtanum		1967	B. Howe
Oak Creek Wildl Area Reintroduction		1970-89	G. Shrinde
Oak Creek Wildlife Area		1984	J. and P. Gaulke
Oak Creek Wildlife Area		1985	L. Stream
Naches River		1972	A. Kidd
Cowiche Creek		1972	M. Carter
Confluence S & mid Fork Cowiche Creek		1974	R. Scherer and L. Konen
Tieton Ranger Station		1976	U.S. For. Serv.
Toppenish Creek		1975	P. Laumeyer
Jumpoff Ridge		1979	R. Stewart
Jumpoff Rd & Tieton Rd		1985	E. Bowhay
Zillah		1979	E. Buschini

Appendix B

Washington Administrative Codes

232-12-297, 232-12-011, 232-12-014

- 2.4 "Endangered" means any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.
- 2.5 "Threatened" means any wildlife species native to the state of Washington that is likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.
- 2.6 "Sensitive" means any wildlife species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats.
- 2.7 "Species" means any group of animals classified as a species or subspecies as commonly accepted by the scientific community.
- 2.8 "Native" means any wildlife species naturally occurring in Washington for purposes of breeding, resting, or foraging, excluding introduced species not found historically in this state.
- 2.9 "Significant portion of its range" means that portion of a species' range likely to be essential to the long term survival of the population in Washington.

LISTING CRITERIA

- 3.1 The commission shall list a wildlife species as endangered, threatened, or sensitive solely on the basis of the biological status of the species being considered, based on the preponderance of scientific data available, except as noted in section 3.4.
- 3.2 If a species is listed as endangered or threatened under the federal Endangered Species Act, the agency will recommend to the commission that it be listed as endangered or threatened as specified in section 9.1. If listed, the agency will proceed with development of a recovery plan pursuant to section 11.1.
- 3.3 Species may be listed as endangered, threatened, or sensitive only when populations are in danger of failing, declining, or are vulnerable, due to factors including but not restricted to limited numbers, disease, predation, exploitation, or habitat loss or change, pursuant to section 7.1.
- 3.4 Where a species of the class Insecta, based on substantial evidence, is determined to present an unreasonable risk to public health, the commission may make the determination that the species need not be listed as endangered, threatened, or sensitive.

DELISTING CRITERIA

- 4.1 The commission shall delist a wildlife species from endangered, threatened, or sensitive solely on the basis of the biological status of the species being

WAC 232-12-297 Endangered, threatened, and sensitive wildlife species classification.

PURPOSE

- 1.1 The purpose of this rule is to identify and classify native wildlife species that have need of protection and/or management to ensure their survival as free-ranging populations in Washington and to define the process by which listing, management, recovery, and delisting of a species can be achieved. These rules are established to ensure that consistent procedures and criteria are followed when classifying wildlife as endangered, or the protected wildlife subcategories threatened or sensitive.

DEFINITIONS

For purposes of this rule, the following definitions apply:

- 2.1 "Classify" and all derivatives means to list or delist wildlife species to or from endangered, or to or from the protected wildlife subcategories threatened or sensitive.
- 2.2 "List" and all derivatives means to change the classification status of a wildlife species to endangered, threatened, or sensitive.
- 2.3 "Delist" and its derivatives means to change the classification of endangered, threatened, or sensitive species to a classification other than endangered, threatened, or sensitive.

considered, based on the preponderance of scientific data available.

- 4.2 A species may be delisted from endangered, threatened, or sensitive only when populations are no longer in danger of failing, declining, are no longer vulnerable, pursuant to section 3.3, or meet recovery plan goals, and when it no longer meets the definitions in sections 2.4, 2.5, or 2.6.

INITIATION OF LISTING PROCESS

- 5.1 Any one of the following events may initiate the listing process.

- 5.1.1 The agency determines that a species population may be in danger of failing, declining, or vulnerable, pursuant to section 3.3.
- 5.1.2 A petition is received at the agency from an interested person. The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the classification process.
- 5.1.3 An emergency, as defined by the Administrative Procedure Act, chapter 34.05 RCW. The listing of any species previously classified under emergency rule shall be governed by the provisions of this section.
- 5.1.4 The commission requests the agency review a species of concern.

- 5.2 Upon initiation of the listing process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the classification process and calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

INITIATION OF DELISTING PROCESS

- 6.1 Any one of the following events may initiate the delisting process:

- 6.1.1 The agency determines that a species population may no longer be in danger of failing, declining, or vulnerable, pursuant to section 3.3.
- 6.1.2 The agency receives a petition from an interested person. The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may no longer be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the delisting process.

- 6.1.3 The commission requests the agency review a species of concern.

- 6.2 Upon initiation of the delisting process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the delisting process and calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

SPECIES STATUS REVIEW AND AGENCY RECOMMENDATIONS

- 7.1 Except in an emergency under 5.1.3 above, prior to making a classification recommendation to the commission, the Agency shall prepare a preliminary species status report. The report will include a review of information relevant to the species' status in Washington and address factors affecting its status, including those given under section 3.3. The status report shall be reviewed by the public and scientific community. The status report will include, but not be limited to an analysis of:

- 7.1.1 Historic, current, and future species population trends
- 7.1.2 Natural history, including ecological relationships (e.g. food habits, home range, habitat selection patterns).
- 7.1.3 Historic and current habitat trends.
- 7.1.4 Population demographics (e.g. survival and mortality rates, reproductive success) and their relationship to long term sustainability.
- 7.1.5 Historic and current species management activities.

- 7.2 Except in an emergency under 5.1.3 above, the agency shall prepare recommendations for species classification, based upon scientific data contained in the status report. Documents shall be prepared to determine the environmental consequences of adopting the recommendations pursuant to requirements of the State Environmental Policy Act (SEPA).

- 7.3 For the purpose of delisting, the status report will include a review of recovery plan goals.

PUBLIC REVIEW

- 8.1 Except in an emergency under 5.1.3 above, prior to making a recommendation to the commission, the agency shall provide an opportunity for interested parties to submit new scientific data relevant to the status report, classification recommendation, and any SEPA findings.

- 8.1.1 The agency shall allow at least 90 days for public comment.

- 8.1.2 The agency will hold at least one public meeting in each of its administrative regions during the public review period.

FINAL RECOMMENDATIONS AND COMMISSION ACTION

- 9.1 After the close of the public comment period, the agency shall complete a final status report and classification recommendation. SEPA documents will be prepared, as necessary, for the final agency recommendation for classification. The classification recommendation will be presented to the commission for action. The final species status report, agency classification recommendation, and SEPA documents will be made available to the public at least 30 days prior to the commission meeting.
- 9.2 Notice of the proposed commission action will be published at least 30 days prior to the commission meeting.

PERIODIC SPECIES STATUS REVIEW

- 10.1 The agency shall conduct a review of each endangered, threatened, or sensitive wildlife species at least every five years after the date of its listing. This review shall include an update of the species status report to determine whether the status of the species warrants its current listing status or deserves reclassification.
- 10.1.1 The agency shall notify any parties who have expressed their interest to the department of the periodic status review. This notice shall occur at least one year prior to end of the five year period required by section 10.1.
- 10.2 The status of all delisted species shall be reviewed at least once, five years following the date of delisting.
- 10.3 The department shall evaluate the necessity of changing the classification of the species being reviewed. The agency shall report its findings to the commission at a commission meeting. The agency shall notify the public of its findings at least 30 days prior to presenting the findings to the commission.
- 10.3.1 If the agency determines that new information suggests that classification of a species should be changed from its present state, the agency shall initiate classification procedures provided for in these rules starting with section 5.1.
- 10.3.2 If the agency determines that conditions have not changed significantly and that the classification of the species should remain unchanged, the agency shall recommend to the commission that the species being reviewed shall retain its present classification status.

- 10.4 Nothing in these rules shall be construed to automatically delist a species without formal commission action.

RECOVERY AND MANAGEMENT OF LISTED SPECIES

- 11.1 The agency shall write a recovery plan for species listed as endangered or threatened. The agency will write a management plan for species listed as sensitive. Recovery and management plans shall address the listing criteria described in sections 3.1 and 3.3, and shall include, but are not limited to:
- 11.1.1 Target population objectives
- 11.1.2 Criteria for reclassification
- 11.1.3 An implementation plan for reaching population objectives which will promote cooperative management and be sensitive to landowner needs and property rights. The plan will specify resources needed from and impacts to the Department, other agencies (including federal, state, and local), tribes, landowners, and other interest groups. The plan shall consider various approaches to meeting recovery objectives including, but not limited to regulation, mitigation, acquisition, incentive, and compensation mechanisms.
- 11.1.4 Public education needs
- 11.1.5 A species monitoring plan, which requires periodic review to allow the incorporation of new information into the status report.
- 11.2 Preparation of recovery and management plans will be initiated by the agency within one year after the date of listing.
- 11.2.1 Recovery and management plans for species listed prior to 1990 or during the five years following the adoption of these rules shall be completed within 5 years after the date of listing or adoption of these rules, whichever comes later. Development of recovery plans for endangered species will receive higher priority than threatened or sensitive species.
- 11.2.2 Recovery and management plans for species listed after five years following the adoption of these rules shall be completed within three years after the date of listing.
- 11.2.3 The agency will publish a notice in the Washington Register and notify any parties who have expressed interest to the department interested parties of the initiation of recovery plan development.
- 11.2.4 If the deadlines defined in sections 11.2.1 and 11.2.2 are not met the department shall notify the public and report the reasons for missing the deadline and the strategy for completing the plan at a

commission meeting. The intent of this section is to recognize current department personnel resources are limiting and that development of recovery plans for some of the species may require significant involvement by interests outside of the department, and therefore take longer to complete.

- 11.3 The agency shall provide an opportunity for interested public to comment on the recovery plan and any SEPA documents.

CLASSIFICATION PROCEDURES REVIEW

- 12.1 The agency and an ad hoc public group with members representing a broad spectrum of interests, shall meet as needed to accomplish the following:
 - 12.1.1 Monitor the progress of the development of recovery and management plans and status reviews, highlight problems, and make recommendations to the department and other interested parties to improve the effectiveness of these processes.
 - 12.1.2 Review these classification procedures six years after the adoption of these rules and report its findings to the commission.

AUTHORITY

- 13.1 The commission has the authority to classify wildlife as endangered under RCW 77.12.020. Species classified as endangered are listed under WAC 232-12-014, as amended.
- 13.2 Threatened and sensitive species shall be classified as subcategories of protected wildlife. The commission has the authority to classify wildlife as protected under RCW 77.12.020. Species classified as protected are listed under WAC 232-12-011, as amended.

[Statutory Authority: RCW 77.12.020, 90-11-066 (Order 442), § 232-12-297, filed 5/15/90, effective 6/15/90.]

WAC 232-12-011 Wildlife classified as protected shall not be hunted or fished. Protected wildlife are designated into three subcategories: Threatened, sensitive, and other.

(1) Threatened species are any wildlife species native to the state of Washington that are likely to become endangered within the foreseeable future throughout a significant portion of their range within the state without cooperative management or removal of threats.

Protected wildlife designated as threatened include ferruginous hawk, *Buteo borealis*; bald eagle, *Haliaeetus leucocephalus*; western pond turtle, *Clemmys marmorata*; green sea turtle, *Chelonia mydas*; loggerhead sea turtle, *Caretta caretta*; Oregon silverspot butterfly, *Speyeria zerene hippolyta*; pygmy rabbit, *Brachylagus idahoensis*.

(2) Sensitive species are any wildlife species native to the state of Washington that are vulnerable or declining and are likely to become endangered or threatened in a significant portion of their range within the state without cooperative management or removal of threats.

(3) Other protected wildlife.

Other protected wildlife include all birds not classified as game birds, predatory birds, or endangered species[,] or designated as threatened species or sensitive species; and fur seal, *Callorhinus ursinus*; fisher, *Martes pennanti*; wolverine, *Gulo luscus*; western gray squirrel, *Sciurus griseus*; Douglas squirrel, *Tamiasciurus douglasii*; red squirrel, *Tamiasciurus hudsonicus*; flying squirrel, *Glaucomys sabrinus*; golden-mantled ground squirrel, *Callospermophilus saturatus*; chipmunks, *Eutamias*; cony or pika, *Ochotona princeps*; hoary marmot, *Marmota caligata* and *olympus*; all wild turtles not otherwise classified as endangered species, or designated as threatened species or sensitive species; mammals of the order Cetacea, including whales, porpoises, and

mammals of the suborder *Pinnipedia* not otherwise classified as endangered species, or designated as threatened species or sensitive species. This section shall not apply to hair seals and sea lions which are threatening to damage or are damaging commercial fishing gear being utilized in a lawful manner or when said mammals are damaging or threatening to damage commercial fish being lawfully taken with commercial gear.

[Statutory Authority: RCW 77.12.020, 90-11-065 (Order 441), § 232-12-011, filed 5/15/90, effective 6/15/90. Statutory Authority: RCW 77.12.040, 89-11-061 (Order 392), § 232-12-011, filed 5/18/89; 82-19-026 (Order 192), § 232-12-011, filed 9/9/82; 81-22-002 (Order 174), § 232-12-011, filed 10/22/81; 81-12-029 (Order 165), § 232-12-011, filed 6/1/81.]

Reviser's note: RCW 34.05.395 requires the use of underlining and deletion marks to indicate amendments to existing rules, and deems ineffectual changes not filed by the agency in this manner. The bracketed material in the above section does not appear to conform to the statutory requirement.

WAC 232-12-014 Wildlife classified as endangered species. Endangered species include: Columbian white-tailed deer, *Odocoileus virginianus leucurus*; Mountain caribou, *Rangifer tarandus*; Blue whale, *Balaenoptera musculus*; Bowhead whale, *Balaena mysticetus*; Finback whale, *Balaenoptera physalus*; Gray whale, *Eschrichtius gibbosus*; Humpback whale, *Megaptera novaeangliae*; Right whale, *Balaena glacialis*; Sei whale, *Balaenoptera borealis*; Sperm whale, *Physeter catodon*; Wolf, *Canis lupus*; Peregrine falcon, *Falco peregrinus*; Aleutian Canada goose, *Branta canadensis leucoparctica*; Brown pelican, *Pelecanus occidentalis*; Leatherback sea turtle, *Dermochelys coriacea*; Grizzly bear, *Ursus arctos horribilis*; Sea Otter, *Enhydra lutris*; White pelican, *Pelecanus erythrorhynchos*; Sandhill crane, *Grus canadensis*; Snowy plover, *Charadrius alexandrinus*; Upland sandpiper, *Bartramia longicauda*; Northern spotted owl, *Strix occidentalis*.

[Statutory Authority: RCW 77.12.020(6), 88-05-032 (Order 305), § 232-12-014, filed 2/12/88. Statutory Authority: RCW 77.12.040, 82-19-026 (Order 192), § 232-12-014, filed 9/9/82; 81-22-002 (Order 174), § 232-12-014, filed 10/22/81; 81-12-029 (Order 165), § 232-12-014, filed 6/1/81.]